

Promising approaches address vasoconstriction, tissue inflammation, cellular aggregation, and reperfusion injury.

The goal of therapy ought not to be simply restoring vital signs. Rather, the aim should be to restore effective oxygen delivery and use. Understanding the physiology of oxygen transport aids in choosing therapy and administering it to the best end points.

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Use and Abuse of Parenteral Nutrition

SINCE THE INTRODUCTION of safe and nutritionally effective total parenteral nutrition (TPN) in the late 1960s, this therapy has been enthusiastically accepted as a major advance in the management of patients unable to eat. Despite nearly 25 years of study, however, many of the judgments derived intuitively or from retrospective reviews have not yet and may never pass the scrutiny of randomized, controlled prospective analysis, in part because of the ethical considerations arising from the need for an unfed control group. Thus, parenteral nutrition remains an apparently potent therapeutic modality used primarily on the basis of clinical judgment and experience and only secondarily on the basis of prospective statistical data.

Although TPN and enteral feedings are nutritionally comparable, enteral nutrition is usually considered preferable when feasible, primarily because it is less expensive. In addition, recent experimental data suggest that enteral feedings may prevent the bacterial translocation sometimes associated with the gut atrophy that occurs in patients receiving TPN. These advantages of enteral nutrition are blunted, however, by the surprisingly high incidence of pulmonary aspiration during tube feedings and the dramatic reduction in complications with TPN in recent years. For many patients, however, TPN is the only option because of conditions that preclude alimentary tract nutrition for more than seven to ten days. For normally nourished patients unable to eat for shorter periods, the protein-sparing effect of 100 to 150 grams of glucose provided in a 5% solution is sufficient.

In some patients, parenteral feedings appear to have benefits in addition to their nutritional effects. The reduced mechanical and secretory activity of the alimentary tract induced by TPN may be valuable in managing inflammatory diseases, such as pancreatitis and regional enteritis. Total parenteral nutrition, often with the concomitant administration of somatostatin, is essential in the management of acute enterocutaneous fistulas. Similarly, patients with the short bowel syndrome all receive TPN initially, and some patients require prolonged or indefinite therapy. In patients with severe malnutrition who require an elective operation, the preoperative administration of TPN for seven to ten days appears to reduce postoperative morbidity and mortality.

During pregnancy, intravenous nutrition provides important benefits to the fetus, including a reversal of subnormal

fetal growth, when intractable hyperemesis gravidarum develops or the woman is otherwise nutritionally compromised. In addition, preliminary reports indicate that TPN provides some specific benefits to patients having liver or bone marrow transplantation. In contrast, specific benefits of TPN in acute renal failure have not been confirmed. While TPN is valuable for cancer patients when malnutrition precludes adequate antitumor therapy, its synergistic effect on the efficacy of chemotherapy or radiotherapy noted in some animal experiments unfortunately has not been shown in humans. Nutrient solutions enriched with the branched-chain amino acids, so attractive in theoretic models of hepatic encephalopathy and hypermetabolic critical illness, also have not proved clinically useful. Administering TPN that provides calories in excess of requirements for energy expenditure or nutritional repletion is contraindicated because of adverse effects on the liver and pulmonary function and no demonstrable nutritional benefit.

With the development of lipid-based infusions that can provide all required nutrients by a peripheral vein, hypocaloric "protein-sparing" regimens are no longer useful. When a nutritional repletion of chronically malnourished patients is undertaken, therapy must be gradual to avoid a series of "refeeding syndromes," including hypokalemia, hypophosphatemia, hypomagnesemia, acute thiamine deficiency, and congestive heart failure. Total parenteral nutrition is not indicated for hopelessly ill patients for whom no effective primary therapy is available, unless the nutritional support provides an improved sense of well-being or substantial psychological palliation.

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Procuring Donor Organs for Transplantation

THE DEMAND FOR transplantable organs increasingly exceeds the supply as transplantation programs and organ recipient criteria expand. Potential donor organ availability has been estimated to be at least two to three times actual procurement rates. The 6%-a-year mortality for the 18,000 to 20,000 patients on the transplant waiting list could be reduced by identifying and correcting problems in the organ procurement process.

The four principal steps that must be completed before organs can be recovered include identifying and screening potential organ donors, formally declaring brain death, obtaining consent for organ donation from next of kin, and physiologically maintaining donor cardiopulmonary and renal function to retain optimal organ function.

Most organ donors can be identified early in their hospital course. In general, patients younger than 70 years with isolated, nonsurvivable central nervous system injury or disease should be considered possible organ donors. The premature limitation or withdrawal of support from this group by well-meaning but uninformed or disinterested physicians accounts for a large number of "lost" donor organs, particularly in